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(71) Applicant

Oy Wartsila AB (Finland),  
Pitkansillanranta 1, 00530 Helsinki, Finland

(72) Inventor

Pertti Vainio

(74) Agent and/or Address for Service

Marks & Clerk,  
57-60 Lincoln's Inn Fields, London WC2A 3LS**(54) Procedure for unrolling a machine roll of paper tissue**

(57) Measurement data required to control the unrolling web speed of paper tissue in a heavy primary or "machine" roll (10) are derived from the surface of the tissue machine roll (10) by means of a separate tachometer generator (12) driven by a speed measuring means in the form of a small-dimension endless belt (13) (or equivalent roller) mounted to contact the surface of the unrolling tissue. This area is compared (at 19) with a desired reference speed and any difference is fed back to control means (17) which controls a drive means (14) acting directly on the shaft of the machine roll. Thus in comparison with known power transmission by surface-belt drives for the machine rolls, quicker acceleration or deceleration and a shorter overall multi-roll line installation, are achieved, leading to less damage and breakage, retained creping and reduced tendency to ply separation.

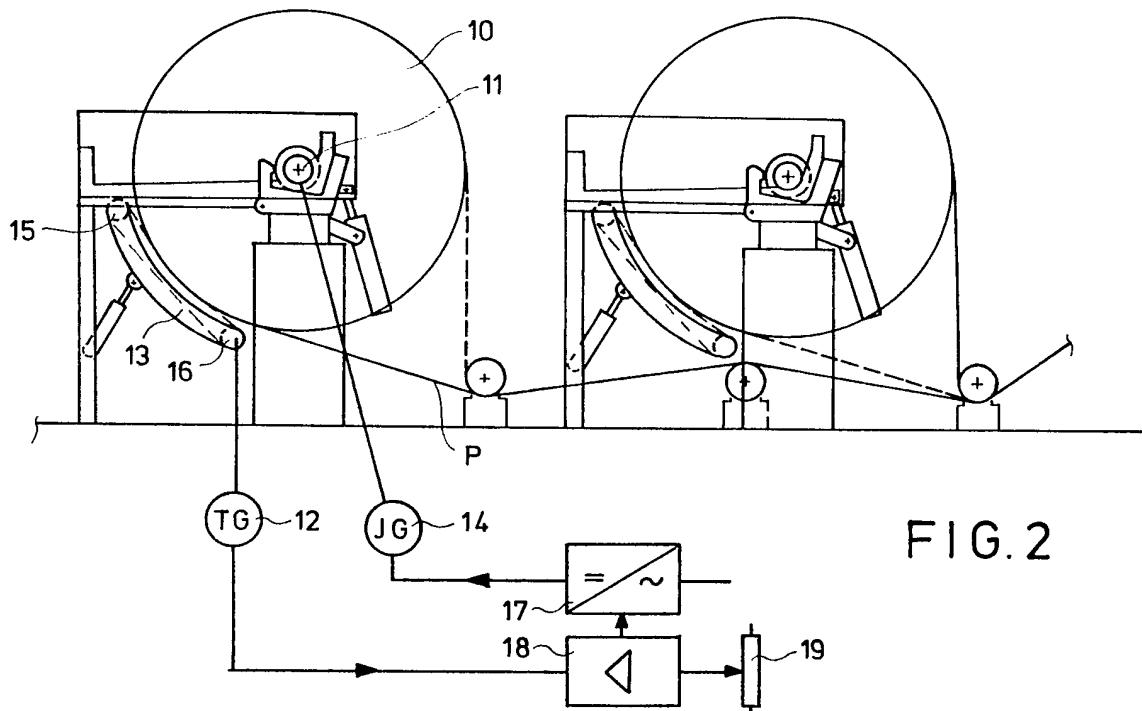


FIG. 2

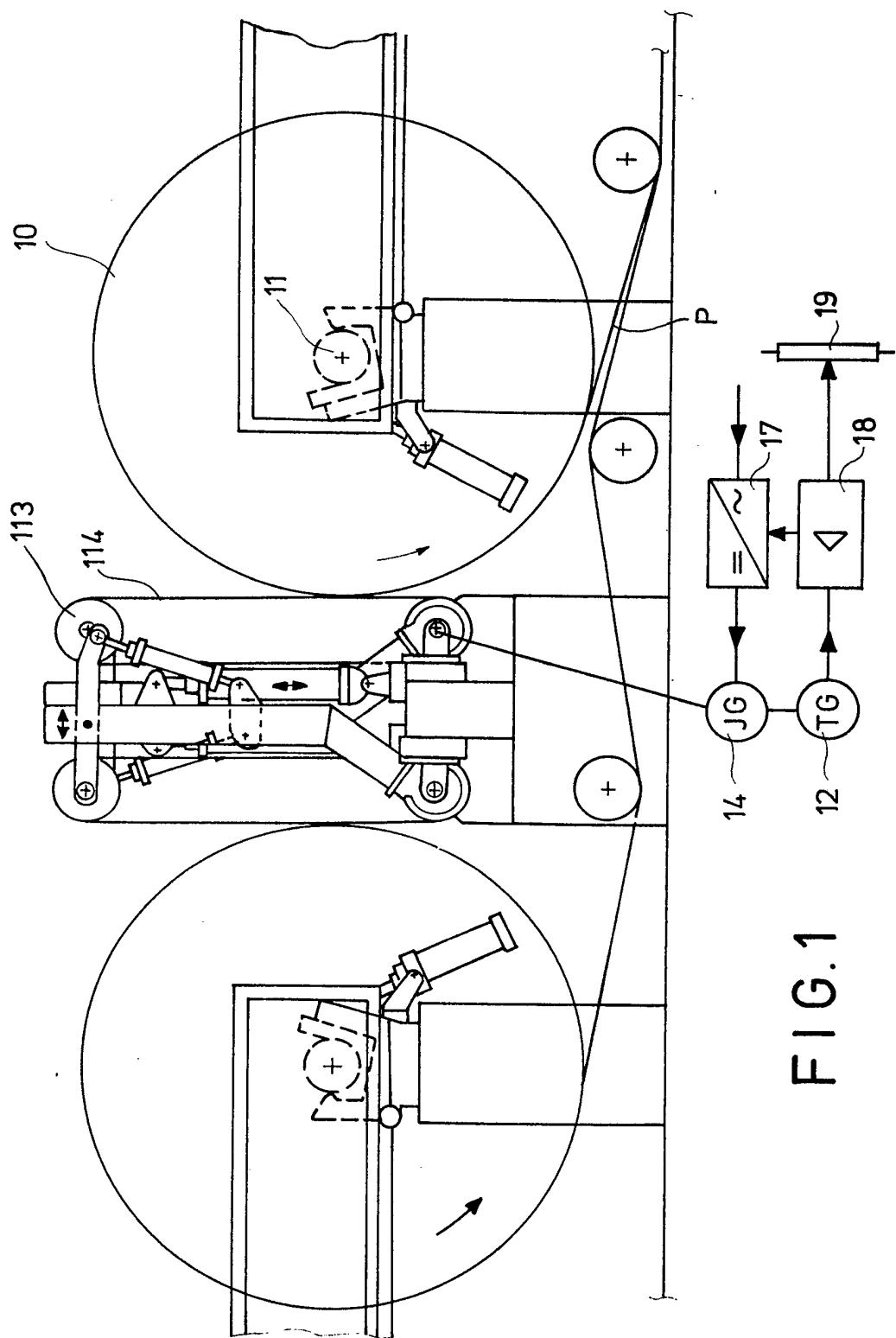
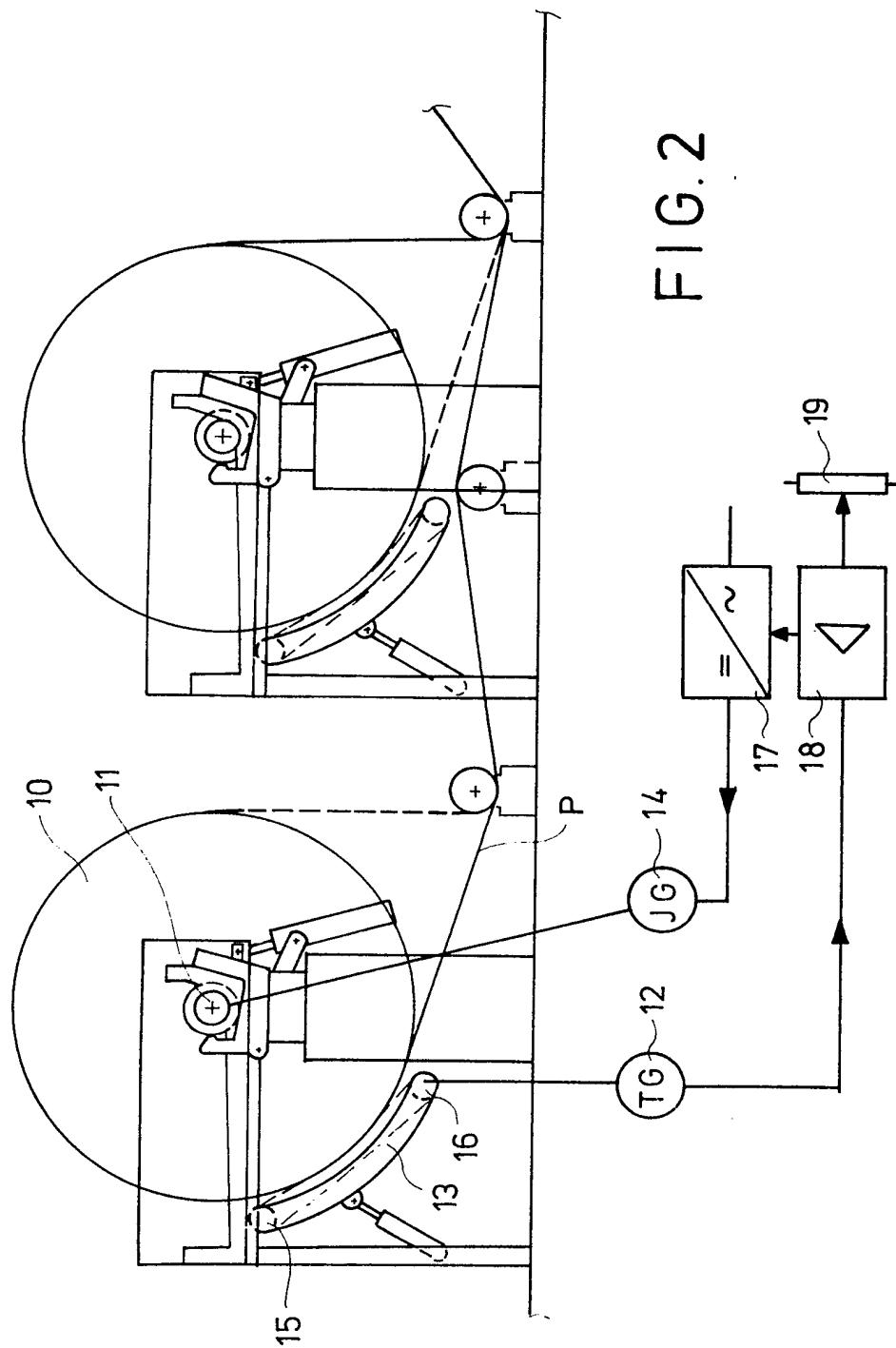


FIG. 1

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FIG. 2



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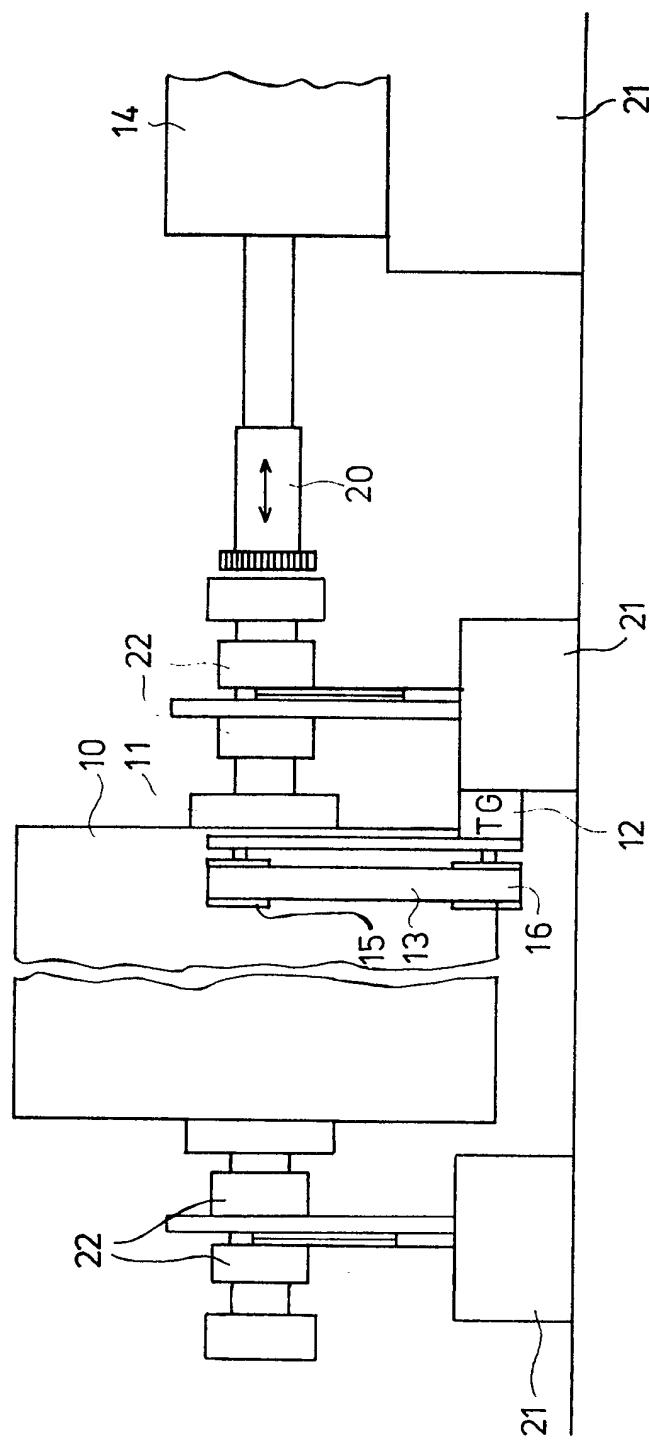


FIG. 3

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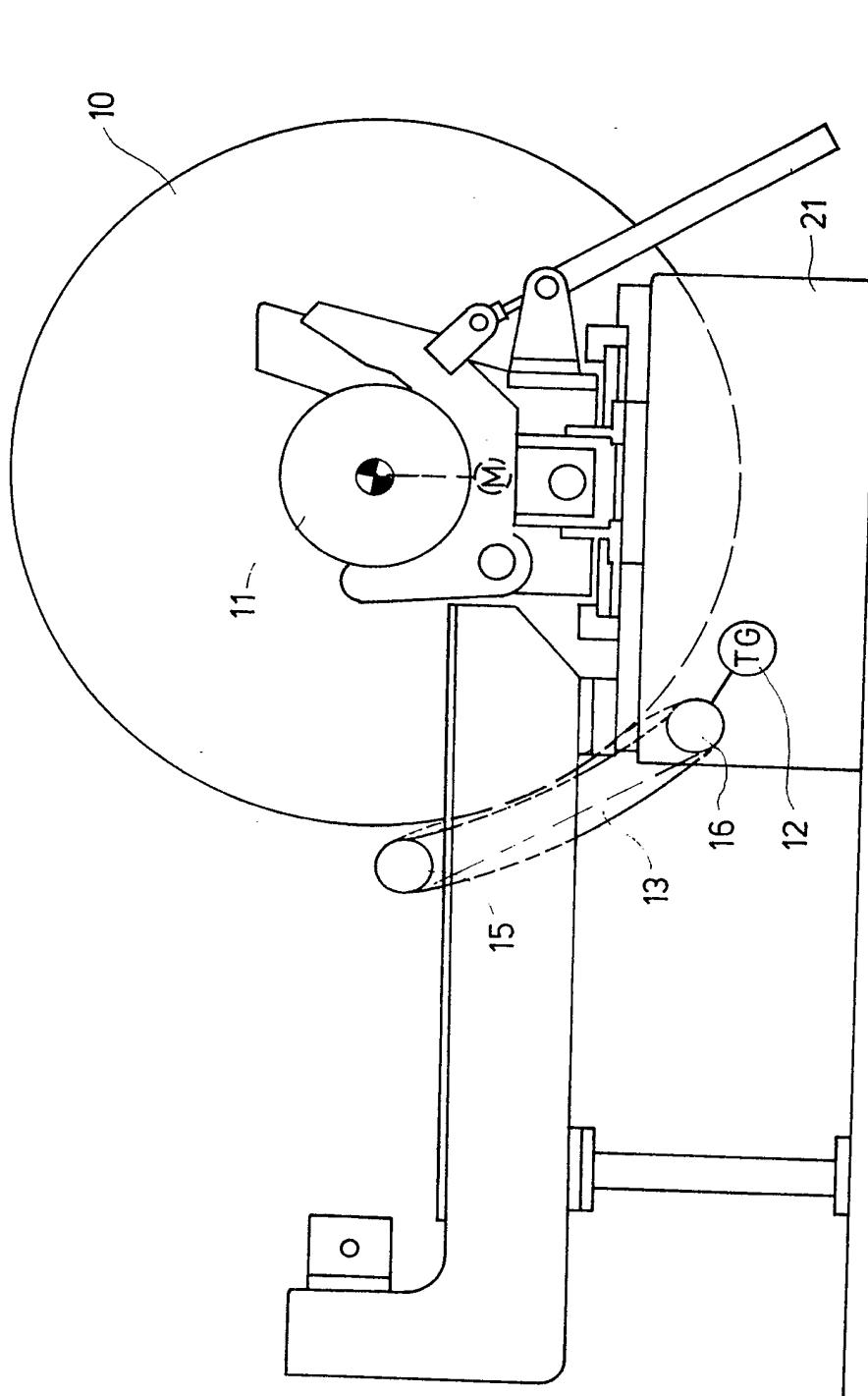


FIG. 4

## SPECIFICATION

## Procedure for unrolling a machine roll of paper tissue

5 The present invention relates to a procedure for unrolling a machine roll of paper tissue. Paper tissue is made on a so-called tissue cutter by procedures which involve unrolling 10 at a controlled speed large heavy primary rolls of single-ply tissue paper, so-called "machine rolls", and re-rolling the tissue as single-ply or multi-ply rolls of smaller dimension. This invention is concerned with directly measuring 15 the web speed of the unrolling tissue and controlling the un-rolling roller speed, as necessary, from this direct measurement. With current procedures it is difficult to drive a machine roll in a tissue cutter. Typically, there are two or more un-rolling rolls arranged, in line, in pairs, with a roll-surface belt-drive arrangements common to or at least located between, the or each pair. This requires a lot of space in the machine, or line, 20 direction and accordingly the average distance between unrolling and re-rolling is significant. This average distance undesirably diminishes the extent of "creping" of each ply of tissue. Also especially at higher rolling speeds, the 25 actual differences of distance give rise to speed-differentials, between the webs feeding the closest and farthest roll-ups stage, (of e.g. about 1% for four machine rolls) which is enough to diminish ply adhesion to the detriment of subsequent processing.

Moreover, roll-surface drive, by contacting belts, takes a great deal of power, leaves marks and pressure streaks where the drive contacts the web and can lead to web break- 30 age. This is especially the case upon acceleration or braking (e.g. for emergency stops) and indeed rapidly responsive acceleration or de- 35 celeration is impossible. Also, the drive-belt mutual support means run transverse to the web and interfere with smooth operation.

The present invention sets out to improve the prior art procedures used in unrolling a machine roll. The invention also sets out to provide a procedure in which the quality of 40 the tissue paper web does not deteriorate in the course of unrolling and in which the unrolling and rolling processes can be brought closer to each other, whereby the harmful differential speeds (caused by elongation of 45 the web due to difference in free flight length) can be reduced or eliminated.

The invention consists in a procedure for unrolling a machine roll of paper tissue in which procedure:

60 (a) web speed measurement data are continuously derived from a tachometer generator with elements contacting and driven by the surface of the machine roll of tissue,

(b) the web-speed data thus derived are 65 compared with a constant speed reference,

and

(c) any difference signal is fed back to control a drive means acting upon the axial shaft of the machine roll, to restore a predetermined web speed.

In the procedure of the invention, the machine roll being unrolled is driven directly from the shaft of the machine roll, like e.g. on a newspaper cutter. The quality of the tissue paper web remains acceptable and the amount of breakage is substantially reduced. For measuring the surface speed, preferably the tachometer generator roll contact and drive is an endless belt of small dimensions 75 mounted to contact the surface of the roll of tissue as it unrolls, or is a roller similarly mounted. Since the driving of a tachometer generator alone requires only a fraction of the power which the existing roll drive belts consume, the belt or roller and the mechanical structure of the tachometer generator can be accommodated in a small space and made light of weight. With the procedure of the invention, the unrolling line can be made 80 significantly shorter than at present. The speed differentials caused by, due to differences in web elongation of different plies, will be less. Web dusting is also reduced. In addition, the acceleration and emergency- 85 stopping time can be reduced to about half of that achieved with existing techniques. Since in the procedure of the invention emergency halting causes no problems, a remarkable advantage is gained in view of wasting tissue 90 paper web.

The invention will be described in detail with reference to an embodiment presented in the accompanying drawings (to which, however, the invention is not intended to be 95 exclusively confined) and in which:

Fig. 1 shows in a schematic block diagram the procedure known in the art for the unrolling of machine rolls,

Fig. 2 shows in a schematic block diagram 100 the procedure of the invention for the unrolling of machine rolls,

Fig. 3 shows an advantageous embodiment of the apparatus for applying the procedure, in front view, and

105 Fig. 4 shows the apparatus of Fig 3 in side elevation.

In the prior art procedure shown in Fig. 1, a machine roll 10 is driven with the aid of a braking generator 14 driving roll 113 and 110 drive belt 114, urged against the surface of the machine roll 10. A tachometer generator 12 produces a signal based on the speed of rotation of the roll 113, to indicate the speed of rotation of the machine roll 10 at each 115 moment. The signal is carried to a comparator member 18, where this momentary speed of rotation of the machine roll 10 is compared with a reference speed at 19. If there should be any difference between these speeds at 120 113 and 19 a control signal is derived and

via control means 17 controls the braking generator 14, so as to act upon the apparatus 113 114 driving the machine roll 10 and restore it to the proper speed, subject to the problems of acceleration and deceleration discussed above.

As may be seen from Fig. 1, two such machine rolls can be driven at suitable speeds each produce a single ply which plies can be accumulated for onward processing.

In the procedure of the invention as shown in Fig. 2, a machine roll 10 to be unwound is driven directly from its shaft 11 by the drive means 14. The web or peripheral speed of the machine roll 10 is controlled with a separate tachometer generator 12 driven by a relatively small belt 13 (or roller, not shown) by the surface of the machine roll 10. On the basis of this web speed measurement data, the tachometer generator 12 controls the drive means 14 of the machine roll 10. Again, a signal proportional to the current speed of rotation of the machine roll 10, and produced by the tachometer generator 12, is conducted to a comparator member 18, and compared with a reference speed at 19 supplied by the member 19 for feedback control by the control means 17, to restore a desired speed in the event of any variation.

Once again, one or more further machine rolls can be associated (as shown, but unreferenced) to produce a multi-ply material.

Figs. 3 and 4, show apparatus in which the drive means 14, advantageously a braking generator, drives a machine roll 10 directly from the shaft 11 over a clutch means 20. The support structures of the apparatus are generally indicated by reference numeral 21 and the bearings by reference numeral 22.

It will be generally apparent from a comparison of Figs. 1 and 2 that by the procedure of the invention, the distance between the unrolling process, and a subsequent rolling process can be shortened. Thus, desired degree of creping is retained in the paper because any speed differential of different plies can be reduced. Likewise, since this differential speed between different web plies is reduced, the eventual plies in the finished product adhere better to each other.

In the foregoing is only presented the principle of design of the invention, and it will be obvious to a person skilled in the art that numerous modifications can be made within the scope of the inventive idea presented in the claims following below.

## CLAIMS

1. A procedure for unrolling a machine roll of paper tissue in which procedure:

- web speed measurement data are continuously derived from a tachometer generator with elements contacting and driven by the surface of the machine roll of tissue,
- the web-speed data thus derived are

compared with a constant speed reference, and

(c) any difference signal is fed back to control a drive means acting upon the axial shaft of the machine roll, to restore a predetermined web speed.

2. A procedure as claimed in claim 1 in which the tachometer generator roll contact and drive is effected by an endless belt of

75 small dimensions mounted to contact the surface of the roll of tissue as it unrolls.

3. A procedure as claimed in claim 1 in which the tachometer generator roll contact and drive is effected by a roller mounted to

80 contact the surface of the roll of tissue as it unrolls.

4. A procedure as claimed in claim 1 and substantially as herein described with reference to Figs. 2, 3 and 4 of the accompanying drawings.

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